

CLAIMS

What is claimed is:

1. A surgical navigation system comprising:

means for tracking an object by detecting the positions of a predetermined number of tracking elements; and

an array body attached to the object, the array body having a predetermined number of tracking element attachment locations greater than the predetermined number of tracking elements, each of the predetermined number of tracking elements being attachable to one of the tracking element attachment locations, the predetermined number of tracking elements being attachable to the array body in alternate predetermined spatial configurations by attaching the tracking elements to different subsets of the tracking element attachment locations, each of the alternate predetermined spatial configurations being uniquely identifiable by the means for tracking such that each of the alternate predetermined spatial configurations can be used to identify different objects to which the tracking elements are attached.
2. The surgical navigation system of claim 1 wherein the tracking elements have planar reflective surfaces detectable by the means for tracking.
3. The surgical navigation system of claim 1 wherein the predetermined number of tracking elements is greater than the minimum number required by the means for tracking to track the object such that redundant tracking information is provided, each of the alternate predetermined spatial configurations further containing unique sub configurations uniquely

identifiable if one of the redundant tracking elements is blocked from detection by the means for tracking.

4. A set of tracking arrays for a surgical navigation system that tracks individual arrays by detecting a predetermined number of tracking elements in each array, the set of tracking arrays comprising:

- a first array body having a predetermined number of tracking element attachment locations greater than the predetermined number of tracking elements in each array, the tracking element attachment locations being arranged in a predetermined spatial pattern;
- a first group of tracking elements equaling in number the predetermined number of tracking elements, each of the tracking elements in the first group of tracking elements being attached to one of the tracking element attachment locations of the first array body to create an array of tracking elements in a predetermined spatial configuration,
- a second array body having a predetermined number of tracking element attachment locations greater than the predetermined number of tracking elements in each array, the tracking element attachment locations being arranged in the same predetermined spatial pattern as those of the first array body;
- a second group of tracking elements equaling in number the predetermined number of tracking elements, each of the tracking elements in the second group of tracking elements being attached to one of the tracking element attachment locations of the second array body to create a second array of tracking

elements in a predetermined spatial configuration distinct from the
predetermined spatial configuration of the first array of tracking elements.

5. The set of tracking arrays of claim 4 wherein each of the first and second arrays of tracking elements is arranged according to a redundant identification scheme such that if any one of the tracking elements in the array is blocked from detection, the remaining tracking elements in the array still form a uniquely identifiable pattern to positively identify the array within the surgical navigation system.
6. A multiple configuration tracking array for use with a surgical navigation system, the surgical navigation system being able to track the array to determine the position of objects to which the array is attached, the array comprising:
 - a predetermined number of tracking elements recognizable by the surgical navigation system to provide position information; and
 - an array body having a number of tracking element attachment locations greater than the predetermined number of tracking elements, the predetermined number of tracking elements being positionable in alternate configurations of attachment locations to produce alternate patterns distinguishable by the surgical navigation system such that different configurations may be correlated to different tracked objects within the system.
7. The multiple configuration tracking array of claim 6 wherein the array body is molded from a polymer.
8. The multiple configuration tracking array of claim 6 wherein the array body includes a cylindrical recess at each of the tracking element attachment locations and the tracking elements include cylindrical bodies engageable with the cylindrical recesses.

9. The multiple configuration tracking array of claim 6 wherein the tracking elements emit light that is tracked by the surgical navigation system.
10. The multiple configuration tracking array of claim 6 wherein the tracking elements include reflective surfaces that are tracked by the surgical navigation system.
11. The multiple configuration tracking array of claim 6 wherein the tracking elements emit sonic waves that are tracked by the surgical navigation system.
12. The multiple configuration tracking array of claim 6 wherein the tracking elements emit electromagnetic field energy that is tracked by the surgical navigation system.
13. A surgical navigation system for tracking an object during a surgical procedure, the system comprising:
 - means for tracking an object by detecting the positions of a predetermined number of tracking elements, each tracking element having a planar reflective surface;
 - and
 - an array body attached to the object, the array body having a predetermined number of tracking element attachment locations, each of the predetermined number of tracking elements being attachable to one of the tracking element attachment locations, the predetermined number of tracking elements being attachable to the array body in a predetermined spatial configuration identifiable by the means for tracking such that the predetermined spatial configuration can be used to identify different objects to which the tracking elements are attached.
14. A method of making a tracking array for use with a surgical navigation system, the method comprising:

providing a first set of a predetermined number of tracking elements;
providing a first array body having a predetermined number of tracking element attachment locations greater than the predetermined number of tracking elements, the tracking element attachment locations being arranged in a spatial pattern; and
attaching the first predetermined number of tracking elements to a subset of the predetermined number of tracking element attachment locations of the first array body to form a first spatial arrangement of tracking elements attached to the first array body.

15. The method of claim 14 further comprising:

providing a second set of tracking elements having the same predetermined number as the first set;
providing a second array body having the same number and pattern of tracking element attachment locations as the first array body; and
attaching the second set of tracking elements to a subset of the tracking element attachment locations of the second array body to form a second spatial arrangement of tracking elements attached to the second array body, the second spatial arrangement of tracking elements being distinct from the first spatial arrangement of tracking elements.